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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|-------------------------|---------------------|------------------|
| 09/924,605 | 08/09/2001 | L. Karsten V. Lindstrom | 64423-GAF/AJ | 5262 |

466 7590 06/24/2003

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| EXAMINER |
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VINH, LAN

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| ART UNIT | PAPER NUMBER |
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1765

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DATE MAILED: 06/24/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/924,605

Applicant(s)

LINDSTROM ET AL.

Examiner

Lan Vinh

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-- Th MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 April 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

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DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

2. Claims 1-2, 9, 36 are rejected under 35 U.S.C. 102(b) as being anticipated by
Chakrabarti et al (US 5,668,049)

Chakrabarti discloses a method of making GaAs laser comprising facet coating with a protective layer. This method comprises the steps of:

----- cleaving the crystal facets in a non-vacuum atmosphere (col 2, lines 38-40) reads -----

on cleaving out the crystal facets exposed to an ambient atmosphere containing air

plasma etching/dry etching the facets in vacuum (2mTorr) to remove native oxide
and contamination from the facets (col 3, lines 16-21)

after removing the native oxide by plasma/dry etching, growing a nitride/native nitride
layer on the facets by exposing/treating the facets in ECR CVD plasma containing
nitrogen (col 3, lines 28-33)

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Regarding claims 2, 9, 36, Chakrabarti discloses that the hydrogen in the plasma removes the native oxide (col 3, lines 20-21), growing a nitride/native nitride layer on the facets to passivate the facets by exposing/treating the facets in ECR CVD plasma containing nitrogen/nitrogen assisted plasma (col 3, lines 30-33)

3. Claim 35 is rejected under 35 U.S.C. 102(e) as being anticipated by Sugiura et al (US 6204,084)

Sugiura discloses a method for manufacturing laser facet having GaAlN/InGaAs layers after the facets undergo organic cleaning. This method comprises the steps of:

adding nitrogen gas to a main carrier gas of hydrogen/argon in a plasma, gradually switching the main carrier gas from hydrogen/argon to nitrogen, the supply of hydrogen/argon gas is stopped (col 21, lines 34-36; col 28, lines 38-40) reads on adding nitrogen gas to an argon plasma and gradually removing argon until only nitrogen plasma is provided

forming/growing a nitride layer (GaN) 17 by supplying plasmatic nitrogen to react with the GaAlN/InGaAs layers 16, 18, layers 16, 18 can be p-type GaN layer not including In (GaAlAs) and n-type InGaAs in the other embodiment (col 21, lines 28-30 , col 22, lines 17-22, see abstract), which reads on making use of native nitridisation since native nitridisation is defined as nitrogen plasma treatment of laser facet layers in page 14 of the specification, forming a contact/interface between the cleaned/contamination free facets surface and the nitride layer (fig 3), fig. 3 also shows a uniform/gradual border line between layers 17, 16 and 18

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 3-8, 10-12 rejected under 35 U.S.C. 103(a) as being unpatentable over Chakrabarti et al (US 5,668,049) in view of Sugiura et al (6,204,084)

Chakrabarti method has been described above in paragraph 2. Unlike the instant claimed inventions as per claims 3-8, Chakrabarti does not specifically disclose performing dry etching the facets with a plasma mixture of atomic nitrogen and another gas, said another gas is being replaced by nitrogen until only nitrogen plasma is provided.

However, Sugiura discloses a method for manufacturing laser facet having GaAlN layer comprises the step of dry etching the facet with a plasma mixture of nitrogen atoms and another gas, the another gas is being replaced by nitrogen until only nitrogen plasma is provided (col 20, lines 49-53; col 21, lines 29-40)

Hence, one skilled in the art would have found it obvious to modify Chakrabarti method by the step of dry etching the facet with a plasma mixture of nitrogen atoms and another gas as per Sugiura because Sugiura states that when only active nitrogen atoms is provided in the plasma the nitrogen vacancy density in the laser facet structure can be reduced and there is merit in which production costs can be much decreased (col 21, lines 60-67)

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Regarding claim 10, since both hydrogen and argon are known inert gases in the art, one skilled in the art would have found it obvious to substitute the hydrogen gas in Chakrabarti dry etching step with argon because hydrogen and argon are equivalent inert gas, thus the substitution of one for the other would have achieved the expected results.

Regarding claim 12, Chakrabarti discloses cleaving the facets to form GaAs layer, growing a nitride layer onto the surface of the facets by treating the facets in ECR CVD plasma containing ionic nitrogen to make an interface between the facet and the nitride layer (col 3, lines 30-33; fig. 1)

6. Claims 13-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chakrabarti et al (US 5,668,049) in view of Horie et al (6,323,052)

Chakrabarti method has been described above in paragraph 2. Unlike the instant claimed inventions as per claims 13-15, Chakrabarti does not specifically disclose creating the additional nitride layer GaN using plasma comprising nitrogen with an extracted beam.

Horie discloses a method for fabricating laser facet comprises the step of forming additional nitride layer of GaN, InGaAs using plasma comprising nitrogen with an extracted beam (col 28, lines 65-67)

Hence, one skilled in the art would have found it obvious to modify Chakrabarti method by forming the additional nitride layer GaN to provide a buffer layer to relieve the insufficient in the substrate bulk crystal as taught by Horie (col 10, lines 62-64)

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Unlike the instant claimed inventions as per claim 16, Chakrabarti does not specifically disclose dry etching the facet at specific energy range of 0-2000 eV in combination with beam angle from 0-90°.

Horie also discloses dry etching the facet at specific energy range of 1000 eV in combination with beam angle 10° (col 10, lines 53-54; col 22, lines 42-43)

Hence, one skilled in the art would have found it obvious to modify Chakrabarti method by dry etching the facet at specific energy range in combination with beam angle as per Horie to broaden the band gap in the vicinities of the facet and that the facet is transparent to the emission length (col 22, lines 52-55)

7. For the purpose of examination, it is known that ion milling is defined as argon or nitrogen plasma treatment in page 12 of the specification.

8. Claims 17-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Horie et al (US 6,323,052) in view of Belouet et al (5,780,120)

Horie discloses a method for fabricating laser facet. This method comprises the steps of:

cleaving the crystal facets under atmospheric pressure (col 32, lines 14-15) reads on cleaving out the crystal facets exposed to an ambient atmosphere containing air

irradiating the facets with Ar plasma in vacuum to remove oxide and contamination after cleaving (col 16, lines 57-58 and col 32, lines 23-26) reads on making ion-milling in vacuum to remove contamination layer provided at the cleaving step

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forming a nitride compound layer (SiN) on the front facet to prevent chemical contamination (col 17, lines 20-21), the band gap in the vicinities of the facet is broaden (col 22, lines 52-54) reads on the nitride compound have band-gap higher than their counter parts.

Unlike the instant claimed invention as per claim 17, Horie does not specifically discloses forming the nitride compound layer (SiN) by nitrogen ion-milling

However, Belouet discloses a method for preparing laser faces comprises the step of forming the nitride compound layer (SiN) by nitrogen plasma /nitrogen ion milling (col 2, lines 23-30)

Hence, one skilled in the art would have found it obvious to modify Horie method by forming the nitride compound layer by nitrogen plasma /nitrogen ion milling as per Belouet because Belouet states that atomic nitrogen under ECR plasma is easier to incorporate in the passivation layer (col 4, lines 24-26)

The limitation of claim 18 has been discussed above.

The limitation of claim 19 has been discussed above in paragraph 8.

Regarding claim 20, Horie discloses the step of growing a nitride layer on the facet of the laser bar (col 17, lines 20-30)

Regarding claim 22, Horie discloses dry etching the facet at specific energy range of 1000 eV in combination with beam angle 10^0 (col 10, lines 53-54; col 22, lines 42-43)

Regarding claims 23-25, Horie discloses forming additional nitride layer of GaN, InGaAs using plasma comprising nitrogen with an extracted beam (col 28, lines 65-67)

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9. Claims 26-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugiura et al (US 6,204,084) in view of Belouet et al (5,780,120)

Sugiura discloses a method for manufacturing laser facet having GaAlN layer.

This method comprises the steps of:

cleaving the laser into laser bar in atmospheric (col 20, lines 37-38), the laser bar having a first and second facet (fig. 18)

stacking the laser bars in a 2 dimensional multiplayer stack/matrix (col 21, lines 16-19; fig. 3)

placing the stacked laser bar/matrix in vacuum in the atmosphere of several Torr (col 22, lines 1-2) reads on placing the matrix in vacuum between 10 Torr and 10^{-11} Torr

removing the natural surface oxide and contamination from the facets using dry etching/ion beam etching using plasma containing hydrogen (col 12, lines 40-44)

forming a GaN layer 40/first nitride layer on the first and second facet (col 20, lines 48-51; fig. 17)

forming a second GaN layer 41/second nitride layer (col 20, lines 51-52)

forming a third GaN layer 55/third thin nitride layer using reactive plasma (col 21, lines 6-10)

forming/adding a passivation layer 74 before a protective /mirror coating (col 23, lines 42-44)

forming an upper/protective layer 64 (col 23, lines 29-30)

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Unlike the instant claimed invention as per claim 26, Sugiura does not explicitly disclose forming a GaN layer 40/first nitride layer using ion beam plasma containing nitrogen.

However, Belouet discloses a method for preparing laser faces comprises the step of forming the nitride compound layer by nitrogen containing plasma /nitrogen ion milling (col 2, lines 23-30)

Hence, one skilled in the art would have found it obvious to modify Sugiura method by forming the nitride compound layer by nitrogen plasma /nitrogen ion milling as per Belouet because Belouet states that atomic nitrogen under ECR plasma is easier to incorporate in the passivation layer (col 4, lines 24-26)

Regarding claim 27, Sugiura discloses using acceleration energy of 200 keV (col 20, lines 1-2)

Regarding claim 28, Sugiura discloses performing a heating step at 1100⁰ C/annealing step followed the cleaving step (col 20, lines 56-57)

Regarding claims 29-31, although Sugiura discloses dry etching using RIE method, Sugiura does not explicitly disclose supplying microwave power, RF power or DC power to excite the plasma. However, since it is known in the art of plasma etching that microwave power, RF power or DC power supply may be used to create plasma in RIE method (see prior art of record for evidence of this basis), one skilled in the art would have found it obvious to employ microwave power, RF power or DC power supply to excite the gas in Sugiura RIE etching step to produce an expected result.

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Regarding claims 32-33, Sugiura discloses using a mixture of nitrogen and hydrogen gases (col 17, lines 58-60)

The limitation of claim 34 has been discussed above.

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Bhardwaj et al (US 6,261,962) discloses that microwave power, RF power or DC power supply may be used to create plasma in RIE method (col 4, lines 14-24)

Response to Arguments

11. Applicant's arguments filed 4/23/2003 have been fully considered but they are not persuasive.

Applicants argue that the SiN/nitride layer as taught by Chakrabarti can not reasonably be construed as a native nitride as it does not represent the nitriding of the GaS layer but rather the depositing of the SiN. First at all, this argument does not commensurate with the scope of claim 1 because claim 1 language does not specifically recite growing a native nitride by nitriding of the GaS layer. In addition, this argument is unpersuasive since Chakrabarti discloses growing a nitride layer (SiN) on the cleaved GaS facets by exposing/treating the facets in ECR CVD plasma containing nitrogen (col 3, lines 28-33) and a native nitride layer is defined as a nitride-comprising element that grows on GaS layer during introduction of nitrogen onto and in reaction with GaS layer

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in page 13 of the specification. Thus, the examiner asserts that nitride layer as taught by Chakrabarti can reasonably be construed as the claimed native nitride.

The argument that Sugura fails to teach the step of introducing nitrogen onto and in reaction with GaAlAs-InGaAs because Sugura discloses introducing nitrogen onto and in reaction with GaAlN and p-type GaN layers 18, 19 in col 21, lines 28-30. This argument is unpersuasive because although the examiner recognizes that Sugura's layers 18, 19 is disclosed as GaAlN and p-type GaN in one embodiment, the examiner notes that Sugura also discloses that layer 18 can be p-type GaN layer not including In (GaAlAs) and n-type InGaAs in the other embodiment (col 21, lines 28-30, col 22, lines 17-22, see abstract). Hence, the examiner asserts that Sugura discloses the step of introducing nitrogen onto and in reaction with GaAlAs-InGaAs layers.

In response to applicant's argument that there is no suggestion/motivation to combine the references of Chakrabarti and Sugura, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case since the motivation to combine the reference comes from Sugura (paragraph 5 above), one skilled in the art would have found it obvious to employ Sugura teaching in Chakrabarti's method to produce the claimed invention.

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The applicants also argue that the reference of Horie discloses the creation of a surface which is cleaned by means of argon at low energy whereas the present inventions as per claims 13-16 provides for a gradual changing interface from one layer to the other. This argument also does not commensurate with the scope of claims 13-16 because claims 13-16 do not require a gradual changing interface from one layer to the other.

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

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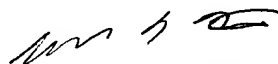
Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is 703 305-6302.

The examiner can normally be reached on M-F 8:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on 703 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308-0661.


BENJAMIN L. UTECH
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

LV
June 19, 2003